

# INFRASTRUCTURE: BARRIERS, PERIMETER DIKES, AND BERMS

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## PURPOSE

This sheet summarizes information about the infrastructure included in the alternative Salton Sea Ecosystem Restoration alternatives. Water control and management structures are employed to stabilize and manage the salinity and elevation of existing or newly created habitat areas needed for the fish and wildlife dependent on the Salton Sea ecosystem.

## RANGE OF ACTIONS

The water management infrastructure facilities under consideration include water retaining features such as barriers, perimeter dikes, and berms. While all of these features serve similar functions, they differ in height, cross section, design materials, placement location, and construction method. These are described in detail below.

## BARRIERS

A barrier is a large rockfill structure, typically over 20 feet in height and crosses the sea from east to west. Barriers are designed to partition the Sea into two areas—a marine sea and a brine (hypersaline) sink. Under the various configurations, the barrier may be up to 55 feet in height and up to 12 miles long. Water depths in the marine sea contained by these barriers may be up to 48 feet deep. The North Sea Combined, and South Sea Combined configurations include the construction of a barrier.

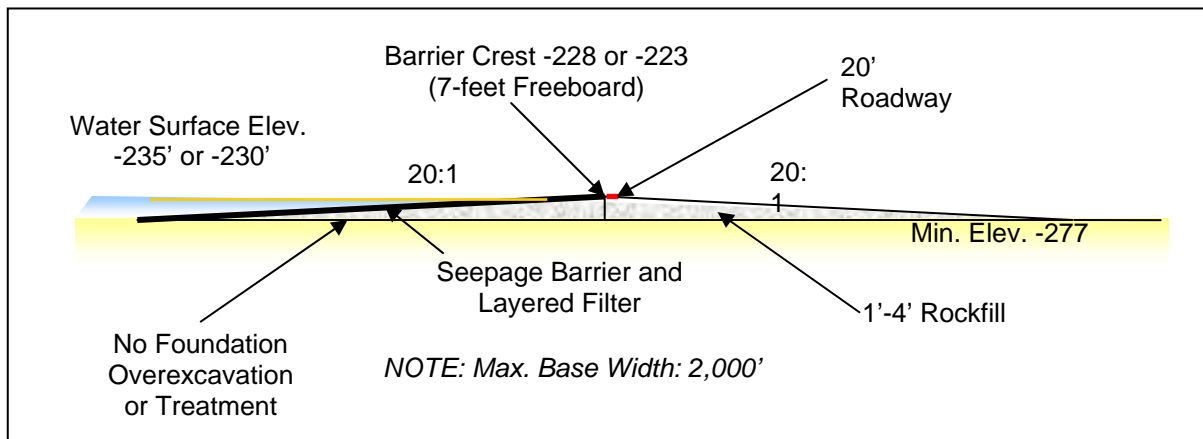
A barrier would be a major project feature and is conservatively designed to meet the following objectives and criteria: Division of Safety of Dams (DSOD) design criteria; control seepage through the structure; control settlement of the structure; resist damage by seismic events (deformation and loss of foundation strength); resist erosive forces; withstand flood loadings and resist flood damage; be constructible; and ensure safe construction.

There are several proposed rockfill barrier designs that are likely to meet these criteria. Examples of various designs are shown in the adjacent figure. For all of the designs, a seepage barrier would be constructed within the rockfill or on the barrier face contacting the marine sea. The difference among designs is primarily whether or not the barrier would be built directly on the Sea-bed or if the foundation would be excavated or “treated” prior to construction.

### Division of Safety of Dams

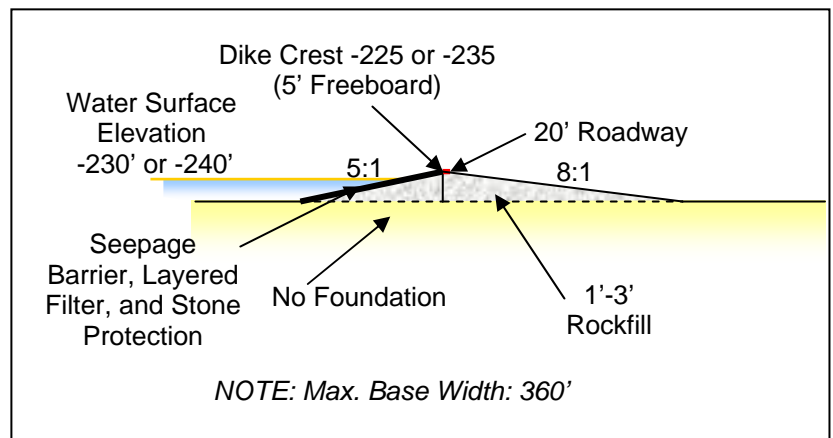
DSOD reviews plans and specifications for the construction of new dams or for the enlargement, alteration, repair, or removal of existing dams. DSOD must grant written approval before construction can proceed on any dam under DSOD’s jurisdiction. DSOD has jurisdiction over dams which are 25 feet or more in height (as measured from the downstream toe of the dam to the maximum possible water storage elevation--spillway) or have an impounding capacity of 50 acre-feet or more.

In all cases, the rock and most other materials for the barriers must be imported. Various local quarry sites are being considered. The initial phases of barrier construction would be completed with barges and other water-borne equipment. The final phases would be finished with land-based equipment. With the most aggressive construction schedule, construction of a major barrier would take over seven years once work is initiated. However, regional air quality issues may limit certain construction activities making the aggressive construction schedule not possible. The construction period may be extended to 20 years to comply with the applicable air quality laws and regulations.



## PERIMETER DIKES

Perimeter dikes are also rockfill barriers, but they are designed to be less than 20 feet in height. Most generally follow alignments parallel to the shoreline. These dikes also partition the Sea into marine and brine sink areas. Perimeter dikes are included in the Concentric Rings, North Sea Combined, and South Sea Combined configurations.



Despite their lower height, perimeter dikes would contain a significant volume of water and are designed to meet the same engineering and safety objectives and criteria as the barrier. Because the perimeter dikes are likely to fall under DSOD's jurisdiction and are at least partially constructed water-borne equipment, only rockfilled dikes are currently being considered. Design cross sections have steeper side slopes (shown in the adjacent figure) than the barrier designs due to their reduced heights.

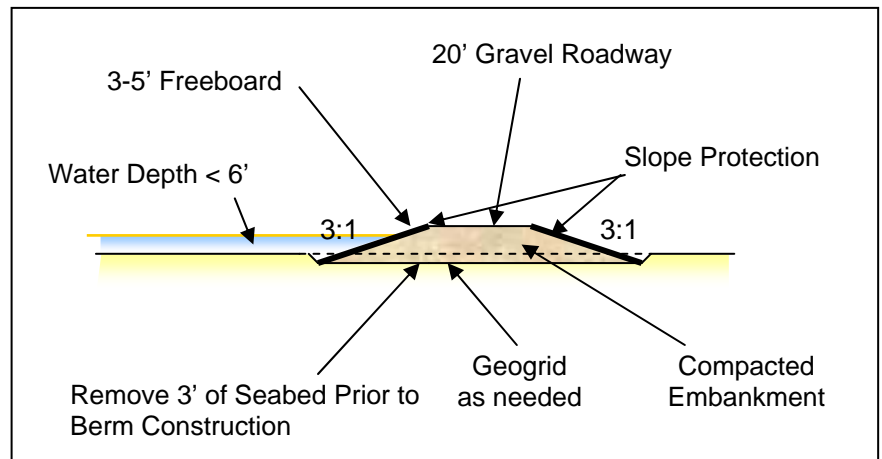
There are several proposed rockfill perimeter dike designs that are likely to meet the design criteria. For all of the proposed designs, a seepage barrier would be constructed. Because of the reduced height of the perimeter dikes, several seepage barrier options such as vinyl piling, slurry walls, and impervious upstream face are available.

For all of the perimeter dike designs, the rockfill must be imported from the various local quarry sites being considered. The construction equipment and techniques would be similar to those described for the barrier construction. On some configurations, rockfill quantities are similar in magnitude to that of a barrier, and therefore construction periods are also similar. Also, like the barrier construction, this schedule may be extended due to regional air quality concerns and compliance with applicable air quality laws and regulations.

## BERMS

Berms are earthen levees designed to partition areas for habitat purposes. They are up to 10 feet in total height and contain water up to 6 feet behind them. Berms would be used to create habitat areas under all of the configurations, and they are the major infrastructure of the Minimal Barrier configuration.

Because the berms heights are low and they contain a relatively small volume of water, they are not designed to the same standards as the barriers and perimeter dikes and will not fall under the DSOD's jurisdiction. These structures will be constructed "in the dry" as the Sea recedes by using suitable local materials, compacted with conventional equipment, and protected from erosion as appropriate. Similar to the construction of the barrier and perimeter dike, construction of the berms would need to comply with the applicable air quality laws and regulations.



## CONSTRUCTION ASSUMPTIONS

With regard to the construction of a barrier, DWR is currently proposing a rockfill design with minimal foundation treatment (excavation) and conservative side slopes. The design is being modified from previous DWR designs (DWR Conceptual Design for In-Sea Rock Barriers, Draft, March 2005) based on recent design investigations and concerns over foundation conditions. The proposed barrier design may be modified in the future when additional information is known about regional geology, seismicity, and site-specific subsurface conditions. Construction related impacts in the Sea due to foundation treatments, overexcavation, and barrier placement are expected to be significant.

DWR is currently proposing a rockfill design for the perimeter dikes. The proposed perimeter dike design may be modified in the future when additional information is known about the regional geology, seismicity, and site-specific subsurface conditions.